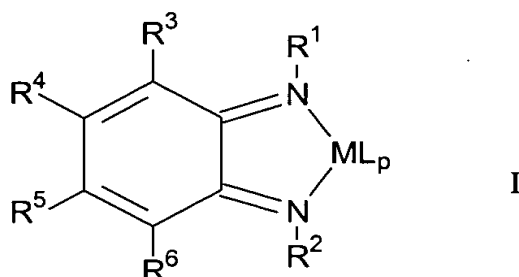


WHAT IS CLAIMED IS:

1. A catalyst comprising a complex having formula I:



where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

R¹ and R² are the same or different and are independently selected from hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, or C₇₋₁₅ aralkyl, each of these optionally substituted with halogen, cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, and with the proviso that not more than 1 of R¹ or R² is a hydrocarbon which is branched at the imino-bonded carbon atom;

R³, R⁴, R⁵, and R⁶ are independently hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, C₇₋₁₅ aralkyl, C₁₋₁₀ alkoxy, or C₁₋₁₀ dialkylamino, each of these optionally substituted with halogen, cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, or wherein any two adjacent R³ through R⁶ form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied.

2. The catalyst of claim 1 wherein M is a metal from Groups 8 to 10 of the Periodic Table.

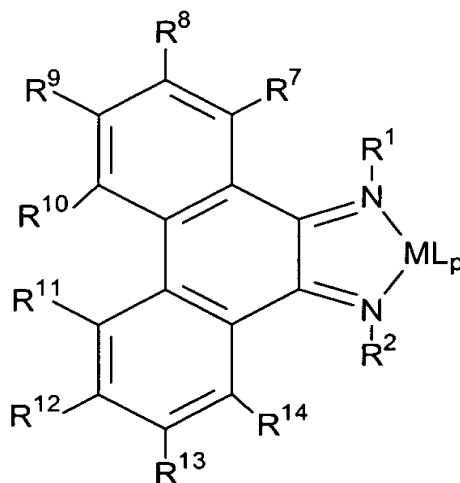
3. The catalyst of claim 1 wherein M is selected from the group consisting of nickel, palladium, iron, and cobalt.

4. The catalyst of claim 1 wherein L is a charged ligand selected from the group consisting of unsubstituted and substituted cyclopentadienyl, indenyl, fluorenyl, hydride, halide, alkyl, aryl, aralkyl, dialkylamino, siloxy, alkoxy, pyrrolyl, indolyl, carbazoyl, quinolinyl, pyridinyl, azaboroliny, boraaryl, and mixtures thereof.

5. The catalyst of claim 1 wherein L is a neutral ligand selected from the group consisting of carbonyl, η^6 -aryl, η^4 -butadiene, η^4 -cyclobutadiene, η^4 -cyclooctatetraene, tertiary phosphine, and mixtures thereof.

6. The catalyst of claim 1 wherein R^1 and R^2 are both hydrogen.

7. The catalyst of claim 1 having formula II:



where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

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6 R¹ and R² are the same or different and are independently
7 selected from hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, or C₇₋₁₅
8 aralkyl, each of these optionally substituted with halogen,
9 cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, and with the proviso that
10 not more than 1 of R¹ or R² is a hydrocarbon which is
11 branched at the imino-bonded carbon atom;
12 R⁷, R⁸, R⁹, R¹⁰, R¹¹, R¹², R¹³, and R¹⁴ are independently
13 hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, C₇₋₁₅ aralkyl, C₁₋₁₀ alkoxy,
14 or C₁₋₁₀ dialkylamino, each of these optionally substituted
15 with halogen, cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, or wherein
16 any two of R⁷ through R¹⁴, or R¹⁰ and R¹¹ form a cyclic
17 structure or are part of a larger ring structure, said cyclic
18 structure and said larger ring structure optionally containing
19 one or more heteroatoms, preferably B, N, O, S, or P;
20 L is a neutral or charged ligand; and
21 p is a integer such that complex I is neutral and the valency
22 of M is satisfied.

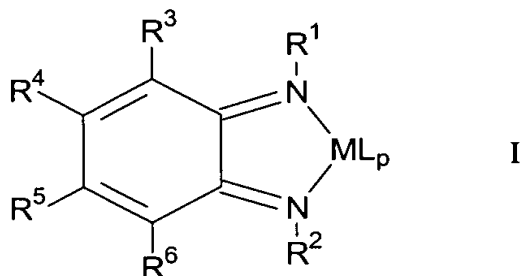
1 8. The catalyst of claim 1 further comprising an activator.

1 9. The catalyst of claim 8 wherein the activator is selected from
2 the group consisting of alumoxanes, alkylaluminum compounds, and mixtures
3 thereof.

1 10. The catalyst of claim 8 wherein the activator is an acid salt
2 containing non-nucleophilic anions.

1 11. The catalyst of claim 8 wherein the activator is selected from
2 the group consisting of lithium tetrakis(pentafluorophenyl) borate, lithium
3 tetrakis(pentafluorophenyl) aluminate, anilinium tetrakis(pentafluorophenyl) borate,
4 and mixtures thereof.

12. A process for coupling two or more olefins, the process comprising:
- 1) introducing into a reaction vessel an activator and a catalyst of claim 1 having formula I:



where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

R¹ and R² are the same or different and are independently selected from hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, or C₇₋₁₅ aralkyl, each of these optionally substituted with halogen, cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, and with the proviso that not more than 1 of R¹ or R² is a hydrocarbon which is branched at the imino-bonded carbon atom;

R³, R⁴, R⁵, and R⁶ are independently hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, C₇₋₁₅ aralkyl, C₁₋₁₀ alkoxy, or C₁₋₁₀ dialkylamino, each of these optionally substituted with halogen, cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, or wherein any two adjacent R³ through R⁶ form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied; and

28 2) introducing at least one olefin into the reaction vessel,
29 wherein at least two molecules of olefin are coupled together.

1 13. The process of claim 12 wherein M is a metal from Groups
2 8 to 10 of the Periodic Table.

1 14. The process of claim 12 wherein M is selected from the group
2 consisting of nickel, palladium, iron, and cobalt.

1 15. The process of claim 12 wherein L is a charged ligand
2 selected from the group consisting of unsubstituted and substituted cyclopentadienyl,
3 indenyl, fluorenyl, hydride, halide, alkyl, aryl, aralkyl, dialkylamino, siloxy,
4 alkoxy, pyrrolyl, indolyl, carbazoyl, quinolinyl, pyridinyl, azaborolinyl, boraaryl,
5 and mixtures thereof.

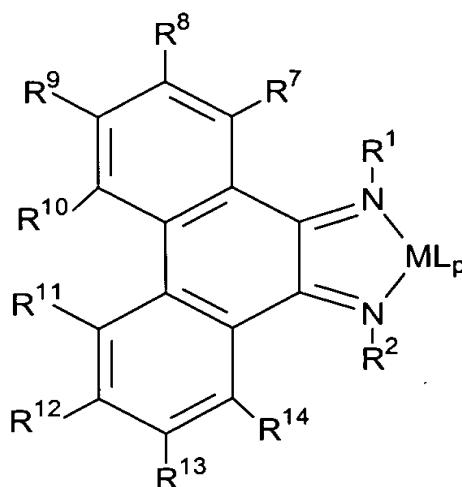
1 16. The process of claim 12 wherein L is a neutral ligand selected
2 from the group consisting of carbonyl, η^6 -aryl, η^4 -butadiene, η^4 -cyclobutadiene,
3 η^4 -cyclooctatetraene, tertiary phosphine, and mixtures thereof.

1 17. The process of claim 12 wherein the activator is selected from
2 the group consisting of alumoxanes, alkylaluminum compounds, and mixtures
3 thereof.

1 18. The process of claim 12 wherein the activator is an acid salt
2 containing non-nucleophilic anions.

1 19. The process of claim 12 wherein the activator is selected from
2 the group consisting of lithium tetrakis(pentafluorophenyl) borate, lithium
3 tetrakis(pentafluorophenyl) aluminate, anilinium tetrakis(pentafluorophenyl) borate,
4 and mixtures thereof.

1 20. The process of claim 12 wherein said catalyst has the formula:



where

M is a metal selected from Groups 3 to 10 of the Periodic Table;

R¹ and R² are the same or different and are independently selected from hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, or C₇₋₁₅ aralkyl, each of these optionally substituted with halogen, cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, and with the proviso that not more than 1 of R¹ or R² is a hydrocarbon which is branched at the imino-bonded carbon atom;

R³, R⁴, R⁵, and R⁶ are independently hydrogen, C₁₋₁₀ alkyl, C₆₋₁₀ aryl, C₇₋₁₅ aralkyl, C₁₋₁₀ alkoxy, or C₁₋₁₀ dialkylamino, each of these optionally substituted with halogen, cyano, C₁₋₄ alkoxy, or C₁₋₄ alkyl, or wherein any two of R⁷ through R¹⁴, or R¹⁰ and R¹¹ form a cyclic structure or are part of a larger ring structure, said cyclic structure and said larger ring structure optionally containing one or more heteroatoms, preferably B, N, O, S, or P;

L is a neutral or charged ligand; and

p is a integer such that complex I is neutral and the valency of M is satisfied.